



Національний технічний університет України
«Київський політехнічний інститут імені Ігоря Сікорського»
Фізико-технічний інститут

КРИПТОГРАФІЯ
КОМП'ЮТЕРНИЙ ПРАКТИКУМ №1
Експериментальна оцінка ентропії на символ джерела
відкритого тексту.

Виконав:
студент III курсу ФТІ
групи ФБ-95
Чорний Анатолій
Перевірила:
Селюх П.В.

Мета роботи:

Засвоєння понять ентропії на символ джерела та його надлишковості, вивчення та порівняння різних моделей джерела відкритого тексту для наближеного визначення ентропії, набуття практичних навичок щодо оцінки ентропії на символ джерела.

Результати:**Ентропія:**

H1 text with spaces: Redundancy H1 text with spaces	4.373595356265287 0.1329790550105705
H2 text with spaces: Redundancy H2 text with spaces	3.977205421124395 0.21155934151508837
H2 text with spaces: Redundancy H2 text with spaces	3.9760836721728126 0.2117817168737618
H1 text with spaces: Redundancy H1 text with spaces	4.451059345217141 0.11762260444010919
H2 text with spaces: Redundancy H2 text with spaces	4.129907085708902 0.18128778442193882
H2 text with spaces: Redundancy H2 text with spaces	4.128074937575835 0.18165098921714617

Monograms:

Зелений колір – 10%

Жовтий колір – 25%

Червоний колір – 50%

Spaces	No spaces
0.1598065262327126	о,0.11463600697026566
о,0.09631639212145293	е,0.08670653656215749
е,0.07285024134851462	а,0.07894256442668435
а,0.06632700485080383	н,0.07139742129863098
н,0.0599876269943981	т,0.06740055000199902
т,0.056629482958857544	и,0.06613255747567222
и,0.055564124276184276	с,0.052966750768151626
с,0.04450230316996131	л,0.047664199727248335
л,0.04004713590796717	в,0.04354940390995128
в,0.03658991249350111	р,0.04173960697080921
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м,0.026508670807571844	д,0.031429924049019335
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к,0.02463876032970621	у,0.025509788920509122
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п,0.0210208308435809	я,0.02014726252201671
я,0.016927592721785446	ь,0.0195215736563572
ь,0.016401893199239098	г,0.019442146831441878
г,0.016335159322024666	ы,0.019433636814486666
ы,0.01632800926375169	з,0.017914396168529734
з,0.015051553622542976	б,0.01649119714249593
б,0.013855791496129265	ч,0.016416633184412156
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ж,0.008521507545524592	х,0.00792444674091431
х,0.0066580661680011735	ш,0.007641184747976489
ш,0.006420071371200723	ю,0.006145042719469425
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э,0.0048545490883845945	щ,0.0035478665925187825
щ,0.002980893341899784	ц,0.003188824924789298
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ф,0.0014041352532261234	ъ,0.000276372931593125
ъ,0.0002322066543889952	

Bigram with spaces, with intersetcions

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н,0.01696845597503335	ом,0.005070754957886142	эт,0.0028273382911627293	ня,0.0014041357313048044
а,0.01648123040968486	ве,0.004993806685511049	л,0.0028242739794309777	ае,0.0013625972833855061
и,0.015940209149490063	ог,0.004865105592777486	ед,0.0027517519351128584	мн,0.0013499995573771943
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с,0.014621193188511692	де,0.004705761382726406	ие,0.002559381254175125	ый,0.0013244636262792651
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хт,3.404790813057236е-05	кв,0.00012291294835136625	зь,1.566203774006329е-05	ышц,6.469102544808749е-06
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Bigram with spaces, without intersctions

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Bigram without spaces, with intersetcions

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мэ,0.00016938980362534703	йя,9.96887361048693е-05	мх,5.754390458085952е-05	ьц,2.1882893291312775е-05
хт,0.00016938980362534703	тг,9.887825857556143е-05	дг,5.754390458085952е-05	уц,2.1072415762004896е-05

тш,2.1072415762004896е-05 вш,2.1072415762004896е-05 юх,2.1072415762004896е-05 яй,2.0261938232697014е-05 жв,2.0261938232697014е-05 юю,2.0261938232697014е-05 пч,2.0261938232697014е-05 рш,1.9451460703389135е-05 шп,1.9451460703389135е-05 нш,1.8640983174081253е-05 дф,1.8640983174081253е-05 цк,1.7830505644773374е-05 вф,1.7830505644773374е-05 мц,1.7830505644773374е-05 цш,1.702002811546549е-05 хх,1.702002811546549е-05 цн,1.702002811546549е-05 хц,1.702002811546549е-05 зъ,1.702002811546549е-05 ыф,1.702002811546549е-05 лш,1.6209550586157612е-05 фы,1.6209550586157612е-05 бд,1.539907305684973е-05 гэ,1.458859552754185е-05 шц,1.458859552754185е-05 цс,1.3778117998233969е-05 жп,1.3778117998233969е-05 чд,1.3778117998233969е-05 чп,1.3778117998233969е-05 эп,1.2967640468926088е-05 зш,1.2967640468926088е-05 юш,1.2157162939618208е-05 шм,1.2157162939618208е-05 бж,1.2157162939618208е-05 жг,1.1346685410310327е-05 фф,1.1346685410310327е-05 жс,1.1346685410310327е-05 лц,1.1346685410310327е-05 жм,1.0536207881002448е-05 чв,1.0536207881002448е-05 фю,1.0536207881002448е-05 съ,9.725730351694567е-06 хь,9.725730351694567е-06 цм,8.915252822386687е-06 фн,8.915252822386687е-06 жэ,8.915252822386687е-06 чс,8.915252822386687е-06 ьш,8.915252822386687е-06 чч,8.915252822386687е-06 бб,8.104775293078806е-06 эх,8.104775293078806е-06 цб,8.104775293078806е-06 эф,8.104775293078806е-06 ьшц,8.104775293078806е-06 шд,8.104775293078806е-06 жт,8.104775293078806е-06 тъ,8.104775293078806е-06 шс,8.104775293078806е-06 пэ,8.104775293078806е-06	цд,7.294297763770925е-06 бп,7.294297763770925е-06 зц,7.294297763770925е-06 пц,7.294297763770925е-06 цр,6.483820234463044е-06 бз,6.483820234463044е-06 цт,6.483820234463044е-06 дю,6.483820234463044е-06 чм,6.483820234463044е-06 зх,6.483820234463044е-06 мю,6.483820234463044е-06 жж,6.483820234463044е-06 йшц,6.483820234463044е-06 йю,5.6733427051551635е-06 гя,5.6733427051551635е-06 гш,5.6733427051551635е-06 пш,5.6733427051551635е-06 мшц,5.6733427051551635е-06 зю,4.862865175847284е-06 эс,4.862865175847284е-06 вю,4.862865175847284е-06 пв,4.862865175847284е-06 эя,4.862865175847284е-06 чэ,4.862865175847284е-06 бт,4.862865175847284е-06 эш,4.862865175847284е-06 жр,4.052387646539403е-06 цр,4.052387646539403е-06 лшц,4.052387646539403е-06 кю,4.052387646539403е-06 шб,4.052387646539403е-06 чб,4.052387646539403е-06 зф,4.052387646539403е-06 пб,4.052387646539403е-06 чя,4.052387646539403е-06 вь,3.241910117231522е-06 шр,3.241910117231522е-06 гх,3.241910117231522е-06 жя,3.241910117231522е-06 эю,3.241910117231522е-06 цз,3.241910117231522е-06 пд,3.241910117231522е-06 кй,3.241910117231522е-06 шз,2.431432587923642е-06 цэ,2.431432587923642е-06 кшц,2.431432587923642е-06 бш,2.431432587923642е-06 фв,2.431432587923642е-06 жю,2.431432587923642е-06 гц,2.431432587923642е-06 фь,2.431432587923642е-06 жз,2.431432587923642е-06 бч,2.431432587923642е-06 хю,2.431432587923642е-06 ця,2.431432587923642е-06 бг,2.431432587923642е-06 цк,1.620955058615761е-06 гж,1.620955058615761е-06 бую,1.620955058615761е-06	цл,1.620955058615761е-06 пг,1.620955058615761е-06 гф,1.620955058615761е-06 цг,1.620955058615761е-06 чг,1.620955058615761е-06 хшц,1.620955058615761е-06 що,1.620955058615761е-06 чх,1.620955058615761е-06 фч,1.620955058615761е-06 шч,1.620955058615761е-06 фп,1.620955058615761е-06 фм,1.620955058615761е-06 шэ,1.620955058615761е-06 пж,1.620955058615761е-06 эв,1.620955058615761е-06 шх,8.104775293078805е-07 пю,8.104775293078805е-07 эе,8.104775293078805е-07 цх,8.104775293078805е-07 цф,8.104775293078805е-07 щг,8.104775293078805е-07 чз,8.104775293078805е-07 фд,8.104775293078805е-07 цш,8.104775293078805е-07 ью,8.104775293078805е-07 жх,8.104775293078805е-07 хь,8.104775293078805е-07 цч,8.104775293078805е-07 шю,8.104775293078805е-07 шс,8.104775293078805е-07 шг,8.104775293078805е-07 жш,8.104775293078805е-07 сш,8.104775293078805е-07 шп,8.104775293078805е-07 лй,8.104775293078805е-07 жц,8.104775293078805е-07 пз,8.104775293078805е-07 зй,8.104775293078805е-07 чц,8.104775293078805е-07 пм,8.104775293078805е-07	
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Оцінки для H(10), H(20), H(30):

Произвольная часть текста: тяготения_как_все_организмы_подчиняются_биологическим_законам_так_и_сущест			Вероятности: $q[1] = 0,4807692$ $q[2] = 0,1153846$ $q[3] = 0,0769230$ $q[4] = 0$ $q[5] = 0$ $q[6] = 0,0576923$ $q[7] = 0$ $q[8] = 0,0384615$ $q[9] = 0$ $q[10] = 0$ $q[11] = 0$ $q[12] = 0$ $q[13] = 0$ $q[14] = 0$ $q[15] = 0$ $q[16] = 0,019230$ $q[17] = 0,019230$ $q[18] = 0$ $q[19] = 0$ $q[20] = 0,019230$ $q[21] = 0,019230$ $q[22] = 0,019230$ $q[23] = 0,019230$ $q[24] = 0,057692$ $q[25] = 0,019230$ $q[26] = 0$ $q[27] = 0$ $q[28] = 0$ $q[29] = 0$ $q[30] = 0,019230$ $q[31] = 0$ $q[32] = 0,019230$
Использованные буквы:			
Порядок n-граммы: 5 ██████ 15 ██████ 20 ██████ 25 ██████ 30 ██████ 35 ██████ 40 ██████ 45 ██████ 50 ██████	Введенный символ: я Символ по счету: 1 Номер эксперимента: 52	Неравенство для энтропии: $2,20049633632964 < H < 2,79436366519836$ Двоичная таблица угаданных символов: 00000000000000010000000000000000 00000000000000000000000000000100 10000000000000000000000000000000 10000000000000000000000000000000 0000000000000000000000000100000000	
Поле ввода символов: я Идїāīēæëöü Äöäīē			
Строка состояния: Вы угадали. Для продолжения опыта нажмите "Продолжить", или "Другой" для выбора другого порядка			

$$0.466 < R < 0.564$$

Произвольная часть текста: все_что_мы_говорим_о_войне_например_оказалось_бы_лишенным_смысла_какой_смыс			Вероятности: $q[1] = 0,3846153$ $q[2] = 0,0961538$ $q[3] = 0,0192307$ $q[4] = 0,1153846$ $q[5] = 0,0576923$ $q[6] = 0,0384615$ $q[7] = 0,0384615$ $q[8] = 0$ $q[9] = 0$ $q[10] = 0$ $q[11] = 0,019230$ $q[12] = 0,019230$ $q[13] = 0,019230$ $q[14] = 0,019230$ $q[15] = 0$ $q[16] = 0,019230$ $q[17] = 0,019230$ $q[18] = 0,019230$ $q[19] = 0$ $q[20] = 0,019230$ $q[21] = 0$ $q[22] = 0$ $q[23] = 0$ $q[24] = 0$ $q[25] = 0$ $q[26] = 0,038461$ $q[27] = 0$ $q[28] = 0$ $q[29] = 0$ $q[30] = 0,019230$ $q[31] = 0,019230$ $q[32] = 0,019230$
Использованные буквы: ., ш, с.			
Порядок n-граммы: 5 ██████ 10 ██████ 15 ██████ 20 ██████ 25 ██████ 35 ██████ 40 ██████ 45 ██████ 50 ██████	Введенный символ: п Символ по счету: 4 Номер эксперимента: 52	Неравенство для энтропии: $2,55295571273871 < H < 3,30980770124351$ Двоичная таблица угаданных символов: 00000100000000000000000000000000 01000000000000000000000000000000 00000000000001000000000000000000 00000000000100000000000000000000 00000100000000000000000000000000	
Поле ввода символов: п Идїāīēæëöü Äöäīē			
Строка состояния: Вы угадали. Для продолжения опыта нажмите "Продолжить", или "Другой" для выбора другого порядка			

$$0.385 < R < 0.494$$

